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(54) **PRODUCTION OF SUBSTRATE FOR INFORMATION RECORDING MEDIUM AND SUBSTRATE FOR INFORMATION RECORDING MEDIUM**

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain a discoid substrate having a smooth face free of protrusions due to the remaining of an abrasive or the like on the surface and capable of lowering the floating amount of a head by grdually or stepwise lowering the abrasive concn. in a polishing liq. finally to zero and then applying finish polishing.

SOLUTION: Polishing is conducted while keeping the abrasive concn. (or the range of fluctuation in abrasive concn.) of a polishing liq. almost constant in the preceding stage, the polishing is conducted while lowering the abrasive concn. finally to zero in the subsequent stage, and finish polishing is completed. As the subsequent stage, for example, the supply of the polishing liq. contg. the abrasive is suspended, and only water is supplied as the polishing liq. In this case, if the water is not circulated in a polishing device but supplied while discharged therefrom, the conc. of the polishing liq. is gradually lowered as a matter of course.

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(54)【発明の名称】　情報記録媒体用基板の製造方法及び情報記録媒体用基板

(57)【要約】
【課題】　表面に研磨剤の残存等に起因する突起がない平滑な面（或いは該突起を低減した平滑な面）を有し、ヘッドの低浮上量化を可能とする情報記録媒体用基板とその製造方法を提供すること。
【解決手段】　円板状基板に、研磨液及び研磨パッドによる仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法において、前記研磨液の研磨剤濃度を徐々に或いは段階的に低下させて仕上げ研磨を行い、最終的には研磨剤濃度を略ゼロにして仕上げ研磨を行うことを特徴とする情報記録媒体用基板の製造方法。

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【特許請求の範囲】

【請求項１】　円板状基板に、研磨液及び研磨パッドによる仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法において、

前記研磨液の研磨剤濃度を徐々に或いは段階的に低下させて仕上げ研磨を行い、最終的には研磨剤濃度を略ゼロにして仕上げ研磨を行うことを特徴とする情報記録媒体用基板の製造方法。

【請求項２】　円板状基板に、研磨液及び研磨パッドによる仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法において、

前記仕上げ研磨加工は、前記研磨液の研磨剤濃度（または研磨剤濃度の変動幅）を略一定にして研磨を行う前段階の研磨工程と、前記研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の研磨工程とにより実施されることを特徴とする情報記録媒体用基板の製造方法。

【請求項３】　最終的には、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給することにより仕上げ研磨を行うことを特徴とする請求項１または２記載の製造方法。

【請求項４】　前記仕上げ研磨を行う前に、或いは仕上げ研磨を行った後に、円板状基板に低温型イオン交換処理を施すことを特徴とする請求項１～３のいずれかに記載の製造方法。

【請求項５】　前記仕上げ研磨の後に低温型イオン交換処理を施したときには、さらに前記仕上げ研磨を再度行うことを特徴とする請求項４記載の製造方法。

【請求項６】　前記研磨パッドは、人工皮革スウェードにより構成されることを特徴とする請求項１～５記載の製造方法。

【請求項７】　請求項１～６に記載の方法により製造された情報記録媒体用基板であり、原子間力顕微鏡により１０μm口の測定領域で測定した主表面の表面粗さがR max100ｵﾝｸﾞｽﾄﾛｰﾑ以下、かつRa 5ｵﾝｸﾞｽﾄﾛｰﾑ以下である情報記録媒体用基板。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、情報記録媒体（例えば、磁気ディスク、光ディスク、光磁気ディスクなど）用基板の製造方法及び情報記録媒体用基板に関するものである。

【０００２】

【従来の技術】情報記録媒体用基板の一例である磁気ディスク用基板として現在実用化されている基板の材料には、アルミニウム及びガラスの２種類がある。また、ガラス基板の材料には、非晶質ガラスと結晶化ガラスがある。そして、アルミニウム基板を使用するハードディスク（情報記録媒体の一例）の製造工程は、例えば、下記の５工程（アルミ圧延板工程、ブランク工程、サブストレート工程、Ni-Pめっき工程、メディア工程）により構成される。

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【０００３】まず、アルミ圧延板工程では、アルミニウム原料を溶解、鋳造し、これを熱間圧延して５ｍｍ程度の板厚にした後に冷間圧延を施すことにより、所定厚さに仕上げる。なお、アルミ圧延板は、コイル状にしてブランク工程に移す。ブランク工程では、アルミ圧延板を所定の内外径に合わせて打ち抜くことにより作製したアルミニウムディスクを鉄製またはアルミ製のスペーサーに挟んで、圧力を加えたまま焼鈍し、板の反り、うねり、歪みを除去する。そして、内外径の寸法を合わせると共に内外周の形状を整えることによりブランクを作製する。

【０００４】サブストレート工程では、スポンジ砥石を用いたブランク両面に対する粗研削・仕上げ研削を行ってから、焼鈍し工程を施すことにより、研削により生じた歪みを除去する。そして、ブランク表面に付着した砥粒や汚れを除去するための洗浄を行ってサブストレートを得る。Ni-Pめっき工程では前処理として、脱脂（非侵食性の脱脂剤によるサブストレート表面の油脂の除去）、エッチング（不均一な自然保護膜の除去）、亜鉛置換処理（置換反応を利用したサブストレート表面への亜鉛膜の形成）をそれぞれ行う。

【０００５】次に、めっき液中にサブストレートを浸漬させ、還元反応によりサブストレート表面にNi-Pめっき層を析出させる。ここで、めっき層の厚さが１２μm程度となるまで析出させる。そして、Ni-Pめっき層が形成されたディスクをポリウレタンの研磨布で挟み、アルミナ系の研磨剤を注入しながら、めっき層の表面を１～２μm程度の研磨厚さにて仕上げ研磨する。

【０００６】なお、磁気ディスク用基板の研磨は、例えば図１に示す概略構成を有する両面研磨加工機（研磨装置）を使用して行われる。前記仕上げ研磨を行った後に、めっき層の表面に残っている研磨剤を除去するための洗浄を行うことにより、アルミニウム製の磁気ディスク用基板が得られる。

【０００７】最後に、メディア工程において磁気ディスク用基板上に磁気記録膜等が形成されることにより、ハードディスクが完成する。一方、ガラス基板を使用するハードディスク（情報記録媒体の一例）は例えば下記の工程により製造される。まず、ブランクと呼ばれる板素材を所望の外径に丸め、次に内径用の孔をあけてから、炭化珪素の微粉を用いてブランク表面をラッピング（荒摺り、第１次ラッピング）する。

【０００８】そして、内外径を所定の寸法、形状に加工した後に、再びブランク表面をラッピング（第２次ラッピング）する。また、ブランクに付着した研磨剤や汚れは、超音波洗浄により取り除く。次に、前記第２次のラッピングを終えたブランク表面を研磨剤（酸化セリウム）により両面研磨して、所定の平面度（３～５μm）

に仕上げた後に、表面に残っている研磨剤等を除去するために洗浄を行う。

【０００９】なお、研磨は、例えば図１に示す概略構成を有する両面研磨加工機（研磨装置）を使用して行われる。基材がナトリウム等を含有する非晶質ガラスの場合には、低温型イオン交換処理による化学強化を施した後に洗浄を行う。次に、表面欠陥を検査することによりガラス製の磁気ディスク用基板（サブストレート）を得ることができる。

【００１０】最後に、この磁気ディスク用基板上に磁気記録膜等を形成すること（メディア工程）により、ガラス基板を使用するハードディスクが完成する。

【００１１】

【発明が解決しようとする課題】従来の製造方法により作製された磁気ディスク用基板の表面には、最終研磨工程で使用された研磨剤が完全に除去されずに突起として残存している。また、ガラス製の磁気ディスク用基板では、最終研磨工程で使用された研磨剤の残存に起因する前記突起の存在に加えて、低温型イオン交換処理工程で発生する基板面の突起も存在する。

【００１２】そして、前記突起物が磁気記録膜形成時に基板面に残存していると、良質な磁気記録膜を得ることができないので問題がある。また、10Gbit / in２の面記録密度に対応したヘッドの浮上量は20nm程度であることを考えても、基板面に前記突起が残存することは、基板の平滑性を著しく損なうこととなり、ヘッドと基板との接触の可能性を大にするので問題がある。

【００１３】本発明は、かかる問題に鑑みてなされたものであり、表面に研磨剤の残存等に起因する突起がない平滑な面（或いは該突起を低減した平滑な面）を有し、ヘッドの低浮上量化を可能とする情報記録媒体用基板とその製造方法を提供することを目的とする。

【００１４】

【課題を解決するための手段】そのため、本発明は第一に「円板状基板に、研磨液及び研磨パッドによる仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法において、前記研磨液の研磨剤濃度を徐々に或いは段階的に低下させて仕上げ研磨を行い、最終的には研磨剤濃度を略ゼロにして仕上げ研磨を行うことを特徴とする情報記録媒体用基板の製造方法（請求項１）」を提供する。

【００１５】また、本発明は第二に「円板状基板に、研磨液及び研磨パッドによる仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法において、前記仕上げ研磨加工は、前記研磨液の研磨剤濃度（または研磨剤濃度の変動幅）を略一定にして研磨を行う前段階の研磨工程と、前記研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の研磨工程とにより実施されることを特徴とする情報記録媒体用基板の製造方法（請求項２）」を提供する。

【００１６】また、本発明は第三に「最終的には、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給することにより仕上げ研磨を行うことを特徴とする請求項１または２記載の製造方法（請求項３）」を提供する。また、本発明は第四に「前記仕上げ研磨を行う前に、或いは仕上げ研磨を行った後に、円板状基板に低温型イオン交換処理を施すことを特徴とする請求項１～３のいずれかに記載の製造方法（請求項４）」を提供する。

【００１７】また、本発明は第五に「前記仕上げ研磨の後に低温型イオン交換処理を施したときには、さらに前記仕上げ研磨を再度行うことを特徴とする請求項４記載の製造方法（請求項５）」を提供する。また、本発明は第六に「前記研磨パッドは、人工皮革スウェードにより構成されることを特徴とする請求項１～５記載の製造方法（請求項６）」を提供する。

【００１８】また、本発明は第七に「請求項１～６に記載の方法により製造された情報記録媒体用基板であり、原子間力顕微鏡により１０μm口の測定領域で測定した主表面の表面粗さがR max100ｵﾝｸﾞｽﾄﾛｰﾑ以下、かつRa 5ｵﾝｸﾞｽﾄﾛｰﾑ以下である情報記録媒体用基板（請求項７）」を提供する。

【００１９】

【発明実施の形態】前述したように、従来の製造方法により作製された情報記録媒体用基板の表面には、最終研磨工程で使用された研磨剤が完全に除去されずに突起として残存している。なお、研磨工程において基板表面に付着した前記研磨剤の殆どは、基板洗浄することにより除去することができる。

【００２０】しかしながら、基板洗浄でも除去しきれない研磨剤（突起）が基板表面に残存しており、しかもこの残存する研磨剤の大きさは微小であるため、目視による基板観察では発見することは困難である。また、ガラス製の情報記録媒体用基板では、最終研磨工程で使用された研磨剤の残存に起因する前記突起の存在に加えて、前述したように低温型イオン交換処理工程で発生する基板面の突起も存在する。

【００２１】一般に、低温型イオン交換処理工程の後でも基板を洗浄するが、低温型イオン交換処理により発生する基板面の突起を洗浄によりすべて除去することは極めて困難である。そして、前記突起が磁気記録膜形成時に基板面に残存していると、良質な磁気記録膜を得ることができない、基板の平滑性を著しく損なうこととなり、ヘッドと基板との接触の可能性を大にする、という問題が生じる。

【００２２】そこで、本発明者らが鋭意研究した結果、本発明者らは、円板状基板に研磨液及び研磨パッドによる仕上げ研磨加工を施す際に、研磨液の研磨剤濃度を徐々に或いは段階的に低下させて仕上げ研磨を行い、最終的には研磨剤濃度を略ゼロにして仕上げ研磨を行えば

（請求項１）、或いは研磨液の研磨剤濃度（または研磨剤濃度の変動幅）を略一定にして研磨を行う前段階の研磨工程と、前記研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の研磨工程とにより仕上げ研磨を行えば（請求項２）、基板表面の研磨剤を前記問題が発生しない程度まで除去できることを見いだした（請求項１～６）。

【００２３】最終的に研磨剤濃度を略ゼロにして仕上げ研磨を行う方法としては、例えば、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給することにより仕上げ研磨を行う方法を挙げることができる（請求項３）。研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給する際に、水を研磨装置（両面研磨加工機）内で循環させずに、たれ流し式に供給すると、研磨装置の研磨パッドと被加工物（円板状基板）の間に供給される研磨液の研磨剤濃度は、必然的に徐々に低下する。

【００２４】そして、水のみを研磨液として供給する時間を長くすれば、被加工物（円板状基板）を水の存在下で物理的に研磨用パッドで擦ることになり、その結果、基板表面の研磨剤を前記問題が発生しない程度まで除去できる。かかる研磨剤除去効果の原因は定かではないが、基板に対して水を供給すると、基板面における水和膜の発生を促進し、研磨パッドが物理的にこの水和膜に作用して、水和膜及び水和膜内にある基板表面から突起した微小異物を除去するものと予想される。

【００２５】本発明にかかる基板の仕上げ研磨に使用する水のPH値は、４～　１０が好適である。また、水としては純水、イオン交換水、水道水等が使用できるが、緩衝溶液を併用してもよい。また、酸、アルカリ、塩類を溶解した水溶液を使用してもよい。このように、本発明にかかる仕上げ研磨によれば、基板に直接作用する物理的な力を極力抑制しつつ、基板表面に発生した軟質な水和膜及び突起した微小異物の除去を押し進めるので、基板にダメージを与えることなく、基板の表面粗さを示すR max値を良好に（低減）することができる。

【００２６】そして、本発明（請求項１～６）によれば、表面に研磨剤の残存等に起因する大きな突起がない平滑な面（或いは該突起を低減した平滑な面）を有し、ヘッドの低浮上量化を可能とする情報記録媒体用基板が得られる。本発明にかかる基板の仕上げ研磨は、低温型イオン交換処理を施した後の情報記録媒体用基板だけでなく、前記イオン交換処理を施す前の情報記録媒体用基板に対しても有効である（請求項４、５）。

【００２７】さらに、本発明にかかる基板の仕上げ研磨は、イオン交換処理を行わない情報記録媒体用基板に対しても有効である。本発明にかかる基板の仕上げ研磨に用いる研磨パッドとしては、ポリウレタンパッド等が使用できるが、人工皮革スウェードにより構成されていることが好ましい（請求項６）。理由は定かでないが、かかる構成にすると、基板にダメージを与えることなく、基板の表面粗さを示すR max値を良好に（低減）する効果が特に大きくなる。

【００２８】本発明にかかる仕上げ研磨は、少なくとも基板表面の突起を除去することを目的としており、仕上げ研磨により除去する厚みは、基板の片面につき100ｵﾝｸﾞｽﾄﾛｰﾑ程度かそれ以下でも前記目的を達成することができる。本発明（請求項１～６）にかかる製造方法により得られた情報記録媒体用基板の面精度の測定は、原子間力顕微鏡を用いて行うことができる。

【００２９】即ち、曲率半径が数十nmよりも小さな探針を備えた原子間力顕微鏡を使用して、基板表面における１０μm口の方形領域を走査すれば、微少な表面の凹凸や突起等を測定できる。なお、触針式の表面粗さ測定における針の曲率半径は、数百nm以上もあり、微少な表面の凹凸、突起等の測定には不向きであり、得られる測定値はかなりの誤差を含むので好ましくない。

【００３０】本発明（請求項１～６）にかかる製造方法によれば、例えば、原子間力顕微鏡により表面１０μm口の測定領域で測定した主表面の表面粗さがR max100ｵﾝｸﾞｽﾄﾛｰﾑ以下、かつRa 5ｵﾝｸﾞｽﾄﾛｰﾑ以下である情報記録媒体用基板（請求項７）が得られる。本発明にかかる平滑な表面を有する基板を情報記録媒体用基板とし、該基板上に記録媒体を形成すれば、ヘッドの浮上量を低く抑えることができるので、情報記録の高密度化に対応することができる。

【００３１】即ち、本発明によれば、ヘッド（例えば、磁気ヘッド）の低浮上量化が可能となり、情報記録媒体（例えば、磁気ディスク）の高密度化（特に線記録密度の増大化）を実現できる。また、情報記録媒体（例えば、磁気ディスク）の高密度化が実現でき、ディスク装置（ハードディスクドライブ装置、例えば磁気ディスクドライブ装置）に搭載されるディスクの枚数削減や、ディスク径のサイズダウンが可能となり、装置を小型化することもできる。

【００３２】特に、ハードディスクドライブ装置の高性能化、小型化、省スペース化が進めば、ハードディスクドライブ装置が搭載されるパソコン等の性能を向上させることができる。以下、本発明を実施例により更に詳細に説明するが、本発明はこれらの例に限定されるものではない。

【００３３】

【実施例】以下の実施例にかかる情報記録媒体用基板を製造する方法は、円板状基板に仕上げ研磨加工を施して、情報記録媒体用の基板を製造する方法であり、円板状基板に研磨液及び研磨パッドによる仕上げ研磨加工を施す際に、研磨液の研磨剤濃度（または研磨剤濃度の変動幅）を略一定にして研磨を行う前段階の研磨工程と、前記研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の研磨工程とによ

り仕上げ研磨を行っている。

【００３４】そして、最終的に研磨剤濃度を略ゼロにして仕上げ研磨を行う方法としては、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給することにより仕上げ研磨を行う方法を採用している。また、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液として供給する際に、水を研磨装置（両面研磨加工機）内で循環させずに、たれ流し式に供給する。　そのため、研磨装置の研磨パッドと被加工物（円板状基板）の間に供給される研磨液の研磨剤濃度は、必然的に徐々に低下して、水のみを研磨液として供給する時間を長くすれば、被加工物（円板状基板）を水の存在下で物理的に研磨用パッドで擦ることになり、その結果、基板表面の研磨剤を十分に除去できる。

＜実施例１＞本実施例の情報記録媒体用基板は、原子間力顕微鏡により１０μm口の測定領域で測定した主表面の表面粗さがRmax　56ｵﾝｸﾞｽﾄﾛｰﾑ、Ra3.9ｵﾝｸﾞｽﾄﾛｰﾑであり、表面に研磨剤の残存等に起因する大きな突起がない平滑な面を有する。

【００３５】以下に製造工程を示す。まず、Ni-Pめっき層を形成したアルミニウム製の磁気ディスク用基板（円板状）を用意して、これに研磨加工（研磨液の研磨剤濃度または研磨剤濃度の変動幅を略一定にして研磨を行う前段階の仕上げ研磨加工）を施した。即ち、両面研磨加工機（研磨装置）の鋳鉄製の上定盤及び下定盤にポリウレタン製または人工皮革スウェード製の研磨パッドを貼り付け、この研磨パッドが固定された上下の研磨定盤の間に、前記磁気ディスク用基板を密着させるとともに、パッドと基板研磨面に研磨液を循環式に供給して、回転・摺動することにより、基板の両面（めっき層）を同時に研磨した。

【００３６】ここで、研磨液としては、アルミナを水で溶いて濃度５重量％としたものを用い、また前記研磨パッドとしては、幅５ｍｍの溝を１０ｍｍ間隔で入れたものを用いた。研磨条件は、研磨加工圧力：30～100g / cm^2、下定盤回転数：5～40rpm、上定盤回転数：5～40rpm、研磨時間：８～１５分とした。

【００３７】次に、前記前段階の研磨加工が施された基板の両面に対して、研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の仕上げ研磨加工をさらに施した。即ち、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液としてたれ流し式に供給することにより、前記前段階の仕上げ研磨加工が施された基板の両面に対して後段階の仕上げ研磨加工をさらに施した。

【００３８】研磨条件は、研磨加工圧力：30～100g / cm^2、下定盤回転数：5～40rpm、上定盤回転数：5～40rpm、研磨時間：２～１０分とした。各仕上げ研磨加工を施した磁気ディスク用基板の主表面を原子間力顕微鏡を用いて表面１０μm口の測定領域で観察したところ、表面粗さがRmax　56ｵﾝｸﾞｽﾄﾛｰﾑ、Ra3.9ｵﾝｸﾞｽﾄﾛｰﾑであった。

【００３９】比較のために、同一のアルミニウム製の磁気ディスク用基板に対して、前記前段階の仕上げ研磨加工の後に基板洗浄のみを行う従来法の処理を施した場合について、処理後の磁気ディスク用基板の主表面を原子間力顕微鏡を用いて表面１０μm口の測定領域で観察したところ、表面粗さがRmax　180ｵﾝｸﾞｽﾄﾛｰﾑ、Ra8ｵﾝｸﾞｽﾄﾛｰﾑであった。

【００４０】また、前記従来法の処理を施した磁気ディスク用基板の主表面上には突起（異物）が残存していたのに対して、本実施例の仕上げ研磨加工を施した基板の主表面上には突起（異物）は特に観察されなかった。従って、明らかに本実施例による仕上げ研磨加工が、アルミニウム製の磁気ディスク用基板の表面平滑化に効果があることがわかった。

＜実施例２＞本実施例の情報記録媒体用基板は、原子間力顕微鏡により１０μm口の測定領域で測定した主表面の表面粗さがRmax　55.1ｵﾝｸﾞｽﾄﾛｰﾑ、Ra2.9ｵﾝｸﾞｽﾄﾛｰﾑであり、表面に研磨剤の残存等に起因する大きな突起がない平滑な面を有する。

【００４１】以下に製造工程を示す。まず、アルミノシリケートガラス製の磁気ディスク用基板（円板状）を用意して、これに研磨加工（研磨液の研磨剤濃度または研磨剤濃度の変動幅を略一定にして研磨を行う前段階の仕上げ研磨加工）を施した。即ち、両面研磨加工機（研磨装置）の鋳鉄製の上定盤及び下定盤に人工皮革スウェード製の研磨パッドを貼り付け、この研磨パッドが固定された上下の研磨定盤の間に、前記磁気ディスク用基板を密着させるとともに、パッドと基板研磨面に研磨液を循環式に供給して、回転・摺動することにより、基板の両面を同時に研磨した。

【００４２】ここで、研磨液としては、酸化セリウムを水で溶いて濃度２重量％としたものを用い、また人工皮革スウェード製の研磨パッドとしては、幅５ｍｍの溝を１０ｍｍ間隔で入れたもの（図２）を用いた。研磨条件は、研磨加工圧力：30～100g / cm^2、下定盤回転数：5～40rpm、上定盤回転数：5～40rpm、研磨時間：８～１５分とした。

【００４３】次に、前記前段階の研磨加工が施された基板の両面に対して、研磨液の研磨剤濃度を低下させ、最終的には研磨剤濃度を略ゼロにして研磨を行う後段階の仕上げ研磨加工をさらに施した。即ち、研磨剤を含む研磨液の供給を遮断し、水のみを研磨液としてたれ流し式に供給することにより、前記前段階の仕上げ研磨加工が施された基板の両面に対して後段階の仕上げ研磨加工をさらに施した。

【００４４】研磨条件は、研磨加工圧力：30～100g / cm^2、下定盤回転数：5～40rpm、上定盤回転数：5～40rpm、研磨時間：２～１０分とした。各仕上げ研磨加工を

施した磁気ディスク用基板の主表面を原子間力顕微鏡を用いて表面１０μm口の測定領域で観察したところ、表面粗さがRmax　45.6ｵﾝｸﾞｽﾄﾛｰﾑ、Ra　2.4ｵﾝｸﾞｽﾄﾛｰﾑであった。また、基板の主表面上には突起（異物）は特に観察されなかった。

【００４５】次に、各仕上げ研磨加工を施した磁気ディスク用基板を洗浄した後に、硝酸カリウムの溶融塩中に浸漬して低温型イオン交換処理を施した。即ち、基板ガラス中のナトリウムイオンをカリウムイオンとイオン交換することにより、基板表面に圧縮応力層を形成した。この低温型イオン交換処理を施した基板を洗浄してから、基板の主表面を原子間力顕微鏡を用いて表面１０μm口の測定領域で観察したところ、表面粗さがR max55.1ｵﾝｸﾞｽﾄﾛｰﾑ、かつRa 2.9ｵﾝｸﾞｽﾄﾛｰﾑであった。

【００４６】このことから、低温型イオン交換処理を施すことにより、表面粗さの値が処理前の表面粗さの値（Rmax　45.6ｵﾝｸﾞｽﾄﾛｰﾑ、Ra　2.4ｵﾝｸﾞｽﾄﾛｰﾑ）よりも増大することがわかる。このことは、低温型イオン交換処理工程においても基板主表面の突起が発生することを示唆している。

【００４７】しかしながら、本実施例にかかる前記仕上げ研磨加工を磁気ディスク用基板に施さないで低温型イオン交換処理を行った場合の基板主表面の表面粗さは、表面１０μm口の測定領域で原子間力顕微鏡により観察した結果、Rmax128ｵﾝｸﾞｽﾄﾛｰﾑ、Ra 3.8ｵﾝｸﾞｽﾄﾛｰﾑであり、突起である異物も観察された。従って、明らかに本実施例による仕上げ研磨加工が、磁気ディスク用基板の表面平滑化に効果があることがわかった。

【００４８】

【発明の効果】以上説明したように、本発明（請求項１～６）によれば、表面に研磨剤の残存等に起因する大きな突起がない平滑な面（或いは該突起を低減した平滑な面）を有し、ヘッドの低浮上量化を可能とする情報記録媒体用基板が得られる。本発明（請求項１～６）にかかる製造方法によれば、例えば、原子間力顕微鏡により表面１０μm口の測定領域で測定した主表面の表面粗さがR max100ｵﾝｸﾞｽﾄﾛｰﾑ以下、かつRa 5ｵﾝｸﾞｽﾄﾛｰﾑ以下である情報記録媒体用基板（請求項７）が得られる。

【００４９】本発明にかかる平滑な表面を有する基板を情報記録媒体用基板とし、該基板上に記録媒体を形成すれば、ヘッドの浮上量を低く抑えることができるので、情報記録の高密度化に対応することができる。即ち、本発明によれば、ヘッド（例えば、磁気ヘッド）の低浮上量化が可能となり、情報記録媒体（例えば、磁気ディスク）の高密度化（特に線記録密度の増大化）を実現できる。

【００５０】また、情報記録媒体（例えば、磁気ディスク）の高密度化が実現でき、ディスク装置（ハードディスクドライブ装置、例えば磁気ディスクドライブ装置）に搭載されるディスクの枚数削減や、ディスク径のサイズダウンが可能となり、装置を小型化することもできる。特に、ハードディスクドライブ装置の高性能化、小型化、省スペース化が進めば、ハードディスクドライブ装置が搭載されるパソコン等の性能を向上させることができる。

【図面の簡単な説明】

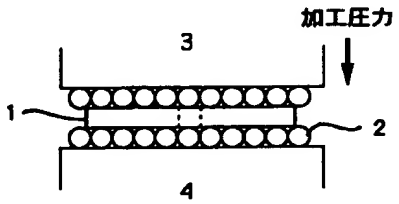
【図１】は、両面研磨加工機の概略構成図である。

【図２】は、本発明にかかる研磨パッドの平面図である。

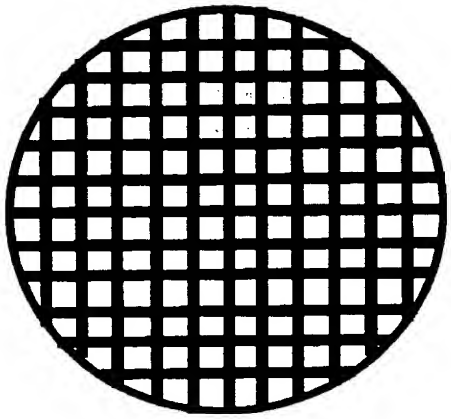
【符号の説明】

１・・磁気ディスク用基板
２・・研磨剤
３・・上定盤
４・・下定盤
以上

【図１】



【図２】



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(72)Inventor : **YOSHINO KUNIHIKO**

(54) PRODUCTION OF SUBSTRATE FOR INFORMATION RECORDING MEDIUM AND SUBSTRATE FOR INFORMATION RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a discoid substrate having a smooth face free of protrusions due to the remaining of an abrasive or the like on the surface and capable of lowering the floating amount of a head by grdually or stepwise lowering the abrasive concn. in a polishing liq. finally to zero and then applying finish polishing.
SOLUTION: Polishing is conducted while keeping the abrasive concn. (or the range of fluctuation in abrasive concn.) of a polishing liq. almost constant in the preceding stage, the polishing is conducted while lowering the abrasive concn. finally to zero in the subsequent stage, and finish polishing is completed. As the subsequent stage, for example, the supply of the polishing liq. contg. the abrasive is suspended, and only water is supplied as the polishing liq. In this case, if the water is not circulated in a polishing device but supplied while discharged therefrom, the conc. of the polishing liq. is gradually lowered as a matter of course.

LEGAL STATUS

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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the manufacture method of the substrate for information record media (for example, a magnetic disk, an optical disk, a magneto-optic disk, etc.), and the substrate for information record media.
[0002]
[Description of the Prior Art] There are two kinds of material of the substrate put in practical use now as a substrate for magnetic disks which is an example of the substrate for information record media, aluminum and glass. Moreover, there are amorphous glass and glass ceramics in the material of a glass substrate. And the manufacturing process of the hard disk (an example of an information record medium) which uses an aluminum substrate is constituted by the five following processes (media process like an aluminum rolled-plate process, blank process, and substrate process and a nickel-P plater).
[0003] First, an aluminum raw material is dissolved and cast in an aluminum rolled-plate process, and predetermined thickness is made at it by cold-rolling, after hot-rolling this and making it about 5mm board thickness. In addition, an aluminum rolled plate is made into the shape of a coil, and is moved to a blank process. At a blank process, the aluminum disk produced by piercing an aluminum rolled plate according to the predetermined diameter of inside and outside is inserted into the spacer made from iron or aluminum, and it anneals, with a pressure applied, and the curvature of a board, a wave, and distortion are removed. And while doubling the size of the diameter of inside and outside, a blank is produced by preparing the configuration of an inside-and-outside periphery.
[0004] At a substrate process, after performing rough grinding and finish grinding to blank both sides which used the sponge grinding stone, distortion produced by grinding is removed by annealing and giving a process. And washing for removing the abrasive grain and dirt adhering to the blank front face is performed, and a substrate is obtained. Degreasing (removal of the fats and oils on the front face of a substrate by the degreaser of un-eating nature), etching (removal of an uneven protection-of-nature film), and zinc substitution processing (formation of a zinc film on the substrate front face using the substitution reaction) are performed as pretreatment like a nickel-P plater, respectively.
[0005] Next, a substrate is made immersed into plating liquid and a nickel-P plating layer is deposited on a substrate front face by the reduction reaction. It is made to deposit here until plating layer thickness is set to about 12 micrometers. And the front face of a plating layer is finished and ground by the polish thickness of about 1-2 micrometers, inserting the disk with which the nickel-P plating layer was formed by the abrasive cloth of polyurethane, and pouring in the abrasive material of an alumina system.
[0006] In addition, polish of the substrate for magnetic disks is performed using the double-sided polish finishing machine (polish equipment) which has the outline composition shown in drawing 1 . After performing the aforementioned finishing polish, the substrate for magnetic disks made from aluminum is obtained by performing washing for removing the abrasive material which remains in the front face of a plating layer.
[0007] Finally, a hard disk is completed by forming a magnetic-recording film etc. on the substrate for magnetic disks in a media process. On the other hand, the hard disk (an example of an information record medium) which uses a glass substrate is manufactured according to the following process. First, after rounding off to the outer diameter of a request of the board material called blank and opening the hole for bores next, a blank front face is wrapped using the fines of a silicon carbide (a rough grind, the first wrapping).
[0008] And after processing the diameter of inside and outside into a predetermined size and a configuration, a blank front face is wrapped again (the second wrapping). Moreover, the abrasive material and dirt which adhered blank are removed by ultrasonic cleaning. Next, it washes in order to remove the abrasive material which remains in the front face, after carrying out double-sided polish of the blank front face which finished the second aforementioned wrapping by the abrasive material (cerium oxide) and making predetermined flatness (3-5 micrometers).
[0009] In addition, polish is performed using the double-sided polish finishing machine (polish equipment) which has the outline composition shown in drawing 1 . In the case of the amorphous glass with which a base material contains sodium etc., it washes, after giving the chemical strengthening by the low-temperature-form ion exchange treatment. Next, the glass substrate for magnetic disks (substrate) can be obtained by inspecting surface discontinuity.
[0010] Finally, the hard disk which uses a glass substrate is completed by forming a magnetic-recording film etc. on this substrate for magnetic disks (media process).

[0011]
[Problem(s) to be Solved by the Invention] In the front face of the substrate for magnetic disks produced by the conventional manufacture method, the abrasive material used at the last polish process remains as a salient, without being removed completely. Moreover, in addition to existence of the aforementioned salient resulting from survival of the abrasive material used at the last polish process, in the glass substrate for magnetic disks, the salient of the substrate side generated at a low-temperature-form ion-exchange-treatment process also exists.
[0012] And if the aforementioned projection remains in the substrate side at the time of magnetic-recording film formation, since a good magnetic-recording film cannot be obtained, there is a problem. Moreover, even if it considers that the flying height of the head corresponding to the field recording density of 10Gbit/in2 is about 20nm, that the aforementioned salient remains in a substrate side will spoil the smooth nature of a substrate remarkably, and since possibility of contact to a head and a substrate is made into size, it has a problem.
[0013] the information record intermediation which has the smooth field (or smooth field which reduced this salient) which this invention is made in view of this problem, and does not have the salient which originates in survival of an abrasive material etc. on a front face, and enables low flying height-ization of a head -- the body and its function -- it aims at offering a substrate and its manufacture method
[0014]
[Means for Solving the Problem] In the method of manufacturing the substrate of the body and its function therefore, finishing polish processing according [this invention] to polish liquid and a polish pad to "disc-like substrate in the first place -- giving -- information record intermediation -- the information record intermediation characterized by grinding by reducing the abrasive material concentration of the aforementioned polish liquid gradually or gradually, and finishing it, and grinding by finally finishing by making abrasive material concentration into abbreviation zero -- the body and its function -- manufacture method (claim 1)" of a substrate is offered
[0015] In the method of manufacturing the substrate of the body and its function moreover, finishing polish processing according [this invention] to polish liquid and a polish pad to "disc-like substrate in the second -- giving -- information record intermediation -- the aforementioned finishing polish processing The polish process of the preceding paragraph story which grinds by making abbreviation regularity abrasive material concentration (or range of fluctuation of abrasive material concentration) of the aforementioned polish liquid, the information record intermediation characterized by carrying out according to the polish process of the latter-part story which the abrasive material concentration of the aforementioned polish liquid is reduced, and grinds by finally making abrasive material concentration into abbreviation zero -- the body and its function -- manufacture method (claim 2)" of a substrate is offered
[0016] Moreover, this invention provides the third with "the manufacture method (claim 3) according to claim 1 or 2 characterized by intercepting supply of the polish liquid containing an abrasive material finally, and grinding by finishing by supplying only water as polish liquid." Moreover, this invention provides the fourth with "the manufacture method (claim 4) according to claim 1 to 3 characterized by giving a low-temperature-form ion exchange treatment to a disc-like substrate before performing the aforementioned finishing polish, or after performing finishing polish."
[0017] Moreover, this invention provides the fifth with "the manufacture method (claim 5) according to claim 4 characterized by performing the aforementioned finishing polish again further when a low-temperature-form ion exchange treatment is given after the aforementioned finishing polish." Moreover, this invention provides the sixth with "the manufacture method (claim 6) according to claim 1 to 5 characterized by the aforementioned polish pad being constituted by artificial leather suede."
[0018] moreover, this invention -- the seventh "-- the information record intermediation manufactured by the method according to claim 1 to 6 -- the body and its function -- the information record intermediation whose surface roughness on the front face of main measured in the measurement field of 10 micrometer** with the atomic force microscope it is a substrate and is 100A or less of R max, and 5A or less of Ra -- the body and its function -- substrate (claim 7)" is offered
[0019]
[The gestalt of invention implementation] the information record intermediation produced by the conventional manufacture method as mentioned above -- the body and its function -- on the surface of a substrate, the abrasive material used at the last polish process remains as a salient, without being removed completely In addition, most aforementioned abrasive materials which adhered to the substrate front face in the polish process are removable by carrying out substrate washing.
[0020] However, it is difficult for the abrasive material (salient) which cannot remove substrate washing, either to remain on the substrate front face, and to discover by the substrate observation by viewing moreover, since the size of this abrasive material that remains is minute. Moreover, in addition to existence of the aforementioned salient resulting from survival of the abrasive material used at the last polish process, in the glass substrate for information record media, the salient of the substrate side generated at a low-temperature-form ion-exchange-treatment process as mentioned above also exists.
[0021] Generally, although a substrate is washed also after a low-temperature-form ion-exchange-treatment process, it is very difficult to remove altogether the salient of the substrate side generated by the low-temperature-form ion exchange treatment by washing. And if the aforementioned salient remains in the substrate side at the time of magnetic-recording film formation, the problem which cannot obtain a good magnetic-recording film of the smooth nature of a substrate being spoiled remarkably and making possibility of contact to a head and a substrate into size will arise.
[0022] As a result of this invention persons' inquiring wholeheartedly, then, this invention persons In case finishing polish processing with polish liquid and a polish pad is given to a disc-like substrate It grinds by reducing the abrasive material

concentration of polish liquid gradually or gradually, and finishing it. The polish process of the preceding paragraph story which will grind by making abbreviation regularity abrasive material concentration (or range of fluctuation of abrasive material concentration) of polish liquid if it grinds by finally finishing by making abrasive material concentration into abbreviation zero (claim 1), When grinding by finishing according to the polish process of the latter-part story which the abrasive material concentration of the aforementioned polish liquid is reduced, and grinds by finally making abrasive material concentration into abbreviation zero (claim 2), it found out that it was removable to the grade in which the aforementioned problem does not generate a substrate surface-lapping agent (claims 1-6).

[0023] As a method of grinding by finally finishing by making abrasive material concentration into abbreviation zero, supply of the polish liquid containing an abrasive material can be intercepted, for example, and the method of grinding by finishing by supplying only water as polish liquid can be mentioned (claim 3). If an effluence formula is supplied without circulating water within polish equipment (double-sided polish finishing machine) in case supply of the polish liquid containing an abrasive material is intercepted and only water is supplied as polish liquid, the abrasive material concentration of the polish liquid supplied between the polish pad of polish equipment and a workpiece (disc-like substrate) will fall gradually inevitably.

[0024] And if time to supply only water as polish liquid is lengthened, it is removable to the grade in which a workpiece (disc-like substrate) will be physically ground with the pad for polish against the bottom of existence of water, consequently the aforementioned problem does not generate a substrate surface-lapping agent. Although the cause of this abrasive material removal effect is not certain, if water is supplied to a substrate, generating of the hydration film in a substrate side will be promoted, a polish pad will act on this hydration film physically, and it will be expected that the minute foreign matter which projected from the substrate front face in a hydration film and a hydration film is removed.

[0025] PH value of the water used for finishing polish of the substrate concerning this invention is 4-. 10 is suitable. Moreover, although pure water, ion exchange water, tap water, etc. can be used as water, you may use a buffer solution together. Moreover, you may use an acid, alkali, and the solution that dissolved salts. Thus, the R max value which shows the surface roughness of a substrate can be made good (reduction), without giving a damage to a substrate, since removal of the elasticity hydration film generated on the substrate front face and the projecting minute foreign matter is pushed suppressing the physical force which carries out direct action to a substrate as much as possible according to the finishing polish concerning this invention.

[0026] and the information record intermediation which has the smooth field (or smooth field which reduced this salient) which does not have the big salient resulting from survival of an abrasive material etc. in a front face according to this invention (claims 1-6), and enables low flying height-ization of a head -- the body and its function -- a substrate is obtained the information record intermediation after finishing polish of the substrate concerning this invention gives a low-temperature-form ion exchange treatment -- the body and its function -- the information record intermediation before giving not only a substrate but the aforementioned ion exchange treatment -- the body and its function -- effective (claims 4 and 5) also to a substrate

[0027] Furthermore, finishing polish of the substrate concerning this invention is effective also to the substrate for information record media which does not perform an ion exchange treatment. As a polish pad used for finishing polish of the substrate concerning this invention, although a polyurethane pad etc. can be used, being constituted by artificial leather suede is desirable (claim 6). Although a reason is not certain, the effect which makes good (reduction) the R max value which shows the surface roughness of a substrate becomes large especially, without giving a damage to a substrate, if it is made this composition.

[0028] The finishing polish concerning this invention aims at removing the salient on the front face of a substrate at least, and the thickness removed by finishing polish can attain the aforementioned purpose even less than [about 100A per one side of a substrate, and it]. Measurement of the profile irregularity of the substrate for information record media obtained by the manufacture method concerning this invention (claims 1-6) can be performed using an atomic force microscope.

[0029] That is, if the atomic force microscope equipped with the probe with radius of curvature smaller than dozens of nm is used and the rectangular field of 10 micrometer** in a substrate front face is scanned, the irregularity of a very small front face, a salient, etc. can be measured. In addition, the radius of curvature of the needle in surface roughness measurement of a sensing-pin formula has hundreds of nm or more, and it is unsuitable for measurement of the irregularity of a very small front face, a salient, etc., and since the measured value obtained includes a remarkable error, it is not desirable.

[0030] the information record intermediation whose surface roughness on the front face of main measured in the measurement field of 10 micrometer [of surface] ** with the atomic force microscope is 100A or less of R max, and 5A or less of Ra, for example according to the manufacture method concerning this invention (claims 1-6) -- the body and its function -- a substrate (claim 7) is obtained If the substrate which has a smooth front face concerning this invention is used as the substrate for information record media and a record medium is formed on this substrate, since the flying height of a head can be stopped low, it can respond to the densification of information record.

[0031] That is, according to this invention, low flying height-ization of a head (for example, magnetic head) is attained, and densification (especially increase-izing of track recording density) of an information record medium (for example, magnetic disk) can be realized. Moreover, densification of an information record medium (for example, magnetic disk) can be realized, number-of-sheets curtailment of the disk carried in a disk unit (hard disk drive equipment, for example, magnetic disk drive equipment) and the size down of the diameter of a disk can be attained, and equipment can also be miniaturized.

[0032] If highly-efficient-izing of hard disk drive equipment, a miniaturization, and ** space-ization progress especially, the performance of the personal computer with which hard disk drive equipment is carried can be raised. Hereafter, although an example explains this invention still in detail, this invention is not limited to these examples.

[0033]

[Example] the information record intermediation concerning the following examples -- the body and its function -- the method of manufacturing a substrate It is the method of manufacturing the substrate of the body and its function. a disc-like substrate -- finishing -- polish processing -- giving -- information record intermediation -- The polish process of the preceding paragraph story which grinds by making abbreviation regularity abrasive material concentration (or range of fluctuation of abrasive material concentration) of polish liquid in case finishing polish processing with polish liquid and a polish pad is given to a disc-like substrate, It is grinding by finishing according to the polish process of the latter-part story which the abrasive material concentration of the aforementioned polish liquid is reduced, and grinds by finally making abrasive material concentration into abbreviation zero.

[0034] And as a method of grinding by finally finishing by making abrasive material concentration into abbreviation zero, supply of the polish liquid containing an abrasive material was intercepted, and the method of grinding by finishing by supplying only water as polish liquid is adopted. Moreover, in case supply of the polish liquid containing an abrasive material is intercepted and only water is supplied as polish liquid, an effluence formula is supplied, without circulating water within polish equipment (double-sided polish finishing machine). Therefore, if the abrasive material concentration of the polish liquid supplied between the polish pad of polish equipment and a workpiece (disc-like substrate) lengthens time to fall gradually inevitably and supply only water as polish liquid, it will grind a workpiece (disc-like substrate) with the pad for polish physically against the bottom of existence of water, consequently can fully remove a substrate surface-lapping agent.

information record intermediation of a <example 1> this example -- the body and its function -- the surface roughness on the front face of main which measured the substrate in the measurement field of 10 micrometer** with the atomic force microscope -- Rmax It is 56A and 3.9A of Ra, and has a smooth field without the big salient which originates in survival of an abrasive material etc. on a front face.

[0035] A manufacturing process is shown below. First, the substrate for magnetic disks made from aluminum (disc-like) in which the nickel-P plating layer was formed was prepared, and polish processing (finishing polish processing of the preceding paragraph story which grinds by making abbreviation regularity the range of fluctuation of the abrasive material concentration of polish liquid or abrasive material concentration) was given to this. That is, the polish pad made from the product made from polyurethane or artificial leather suede was stuck on the top board and lower lapping plate made of cast iron of a double-sided polish finishing machine (polish equipment), while sticking the aforementioned substrate for magnetic disks between the turn tables of the upper and lower sides to which this polish pad was fixed, polish liquid was supplied to the pad and the substrate polished surface circulating, and both sides (plating layer) of a substrate were simultaneously ground rotation and by sliding.

[0036] Here, as the aforementioned polish pad, what put in the slot with a width of face of 5mm at intervals of 10mm was used, using what melted the alumina with water and was made into 5 % of the weight of concentration as polish liquid. Polish conditions were made into polish processing pressure force:30-100g / cm2, lower-lapping-plate rotational frequency:5 - 40rpm, top-board rotational frequency:5 - 40rpm, and polish time:8 - 15 minutes.

[0037] Next, finishing polish processing of the latter-part story which the abrasive material concentration of polish liquid is reduced and grinds by finally making abrasive material concentration into abbreviation zero to both sides of a substrate to which polish processing of the aforementioned preceding paragraph story was given was given further. That is, finishing polish processing of a latter-part story was further given to both sides of a substrate to which finishing polish processing of the aforementioned preceding paragraph story was given by intercepting supply of the polish liquid containing an abrasive material, discharging only water as polish liquid, and supplying a formula.

[0038] Polish conditions were made into polish processing pressure force:30-100g / cm2, lower-lapping-plate rotational frequency:5 - 40rpm, top-board rotational frequency:5 - 40rpm, and polish time:2 - 10 minutes. Surface roughness is Rmax when the main front face of the substrate for magnetic disks which gave each finishing polish processing was observed in the measurement field of 10 micrometer [of surface] ** using the atomic force microscope. They were 56A and 3.9A of Ra.

[0039] Surface roughness is Rmax when the main front face of the substrate for magnetic disks after processing was observed in the measurement field of 10 micrometer [of surface] ** to the same substrate for magnetic disks made from aluminum using the atomic force microscope about the case where the conventional method which performs only substrate washing after finishing polish processing of the aforementioned preceding paragraph story is processed, for comparison. They were 180A and 8A of Ra.

[0040] Moreover, on the main front face of the substrate which gave finishing polish processing of this example, especially the salient (foreign matter) was not observed to the salient (foreign matter) having remained on the main front face of the substrate for magnetic disks which processed the aforementioned conventional method. Therefore, it turns out that finishing polish processing by this example has an effect in surface smoothing of the substrate for magnetic disks made from aluminum clearly.

information record intermediation of a <example 2> this example -- the body and its function -- the surface roughness on the front face of main which measured the substrate in the measurement field of 10 micrometer** with the atomic force microscope -- Rmax It is 55.1A and 2.9A of Ra, and has a smooth field without the big salient which originates in survival of an abrasive material etc. on a front face.

[0041] A manufacturing process is shown below. First, the substrate for magnetic disks made from alumino silicate glass (disc-like) was prepared, and polish processing (finishing polish processing of the preceding paragraph story which grinds by making abbreviation regularity the range of fluctuation of the abrasive material concentration of polish liquid or abrasive material concentration) was given to this. That is, the polish pad made from artificial leather suede was stuck on the top board and lower lapping plate made of cast iron of a double-sided polish finishing machine (polish equipment), while sticking the aforementioned substrate for magnetic disks between the turn tables of the upper and lower sides to which this polish pad was fixed, polish liquid

was supplied to the pad and the substrate polished surface circulating, and both sides of a substrate were simultaneously ground rotation and by sliding.
[0042] Here, as a polish pad made from artificial leather suede, what put in the slot with a width of face of 5mm at intervals of 10mm (drawing 2) was used, using what melted the cerium oxide with water and was made into 2 % of the weight of concentration as polish liquid. Polish conditions were made into polish processing pressure force:30-100g / cm2, lower-lapping-plate rotational frequency:5 - 40rpm, top-board rotational frequency:5 - 40rpm, and polish time:8 - 15 minutes.
[0043] Next, finishing polish processing of the latter-part story which the abrasive material concentration of polish liquid is reduced and grinds by finally making abrasive material concentration into abbreviation zero to both sides of a substrate to which polish processing of the aforementioned preceding paragraph story was given was given further. That is, finishing polish processing of a latter-part story was further given to both sides of a substrate to which finishing polish processing of the aforementioned preceding paragraph story was given by intercepting supply of the polish liquid containing an abrasive material, discharging only water as polish liquid, and supplying a formula.
[0044] Polish conditions were made into polish processing pressure force:30-100g / cm2, lower-lapping-plate rotational frequency:5 - 40rpm, top-board rotational frequency:5 - 40rpm, and polish time:2 - 10 minutes. Surface roughness is Rmax when the main front face of the substrate for magnetic disks which gave each finishing polish processing was observed in the measurement field of 10 micrometer [of surface] ** using the atomic force microscope. 45.6A, Ra It was 2.4A. Moreover, especially the salient (foreign matter) was not observed on the main front face of a substrate.
[0045] Next, after washing the substrate for magnetic disks which gave each finishing polish processing, it was immersed into the fused salt of a potassium nitrate, and the low-temperature-form ion exchange treatment was given. That is, the compressive-stress layer was formed in the substrate front face by carrying out the ion exchange of the sodium ion in substrate glass to potassium ion. After washing the substrate which gave this low-temperature-form ion exchange treatment, when the main front face of a substrate was observed in the measurement field of 10 micrometer [of surface] ** using the atomic force microscope, surface roughness was 55.1A of R max, and 2.9A of Ra.
[0046] From this, by giving a low-temperature-form ion exchange treatment shows increasing rather than the value (Rmax 45.6 A, Ra 2.4 A) of the surface roughness before the value of surface roughness processing. This has suggested that the salient of a substrate main front face occurs also in a low-temperature-form ion-exchange-treatment process.
[0047] However, the surface roughness of the substrate main front face at the time of performing a low-temperature-form ion exchange treatment without giving the aforementioned finishing polish processing concerning this example to the substrate for magnetic disks is 128A of Rmax(es), and 3.8A of Ra, as a result of observing with an atomic force microscope in the measurement field of 10 micrometer [of surface] **, and the foreign matter which is a salient was also observed. Therefore, it turns out that finishing polish processing by this example has an effect in surface smoothing of the substrate for magnetic disks clearly.
[0048]
[Effect of the Invention] the information record intermediation which has the smooth field (or smooth field which reduced this salient) which does not have the big salient resulting from survival of an abrasive material etc. in a front face according to this invention (claims 1-6) as explained above, and enables low flying height-ization of a head -- the body and its function -- a substrate is obtained the information record intermediation whose surface roughness on the front face of main measured in the measurement field of 10 micrometer [of surface] ** with the atomic force microscope is 100A or less of R max, and 5A or less of Ra, for example according to the manufacture method concerning this invention (claims 1-6) -- the body and its function -- a substrate (claim 7) is obtained
[0049] If the substrate which has a smooth front face concerning this invention is used as the substrate for information record media and a record medium is formed on this substrate, since the flying height of a head can be stopped low, it can respond to the densification of information record. That is, according to this invention, low flying height-ization of a head (for example, magnetic head) is attained, and densification (especially increase-izing of track recording density) of an information record medium (for example, magnetic disk) can be realized.
[0050] Moreover, densification of an information record medium (for example, magnetic disk) can be realized, number-of-sheets curtailment of the disk carried in a disk unit (hard disk drive equipment, for example, magnetic disk drive equipment) and the size down of the diameter of a disk can be attained, and equipment can also be miniaturized. If highly-efficient-izing of hard disk drive equipment, a miniaturization, and ** space-ization progress especially, the performance of the personal computer with which hard disk drive equipment is carried can be raised.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] finishing polish processing according to polish liquid and a polish pad to a disc-like substrate -- giving -- information record intermediation -- the information record intermediation characterized by to grind by reducing the abrasive material concentration of the aforementioned polish liquid gradually or gradually, and finishing it in the method of manufacturing the substrate of the body and its function, and to grind by finally finishing by making abrasive material concentration into abbreviation zero -- the body and its function -- the manufacture method of a substrate
[Claim 2] In the method of manufacturing the substrate of the body and its function finishing polish processing according to polish liquid and a polish pad to a disc-like substrate -- giving -- information record intermediation -- the aforementioned finishing polish processing The polish process of the preceding paragraph story which grinds by making abbreviation regularity abrasive material concentration (or range of fluctuation of abrasive material concentration) of the aforementioned polish liquid, the information record intermediation characterized by carrying out according to the polish process of the latter-part story which the abrasive material concentration of the aforementioned polish liquid is reduced, and grinds by finally making abrasive material concentration into abbreviation zero -- the body and its function -- the manufacture method of a substrate
[Claim 3] It is the manufacture method according to claim 1 or 2 characterized by intercepting supply of the polish liquid containing an abrasive material finally, and grinding by finishing by supplying only water as polish liquid.
[Claim 4] The manufacture method according to claim 1 to 3 characterized by giving a low-temperature-form ion exchange treatment to a disc-like substrate before performing the aforementioned finishing polish, or after performing finishing polish.
[Claim 5] The manufacture method according to claim 4 characterized by performing the aforementioned finishing polish again further when a low-temperature-form ion exchange treatment is given after the aforementioned finishing polish.
[Claim 6] The aforementioned polish pad is the manufacture method according to claim 1 to 5 characterized by being constituted by artificial leather suede.
[Claim 7] the information record intermediation manufactured by the method according to claim 1 to 6 -- the body and its function -- the information record intermediation whose surface roughness on the front face of main measured in the measurement field of 10 micrometer** with the atomic force microscope it is a substrate and is 100A or less of R max, and 5A or less of Ra -- the body and its function -- a substrate

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram of ** and a double-sided polish finishing machine.
[Drawing 2] It is the plan of the polish pad concerning ** and this invention.
[Description of Notations]
1 .. Substrate for magnetic disks
2 .. Abrasive material
3 .. Top board
4 .. Lower lapping plate
Above

[Translation done.]